

REMARKS

This is intended as a full and complete response to the Final Office Action dated April 8, 2004, having a shortened statutory period for response set to expire on June 8, 2004. Please reconsider the claims pending in the application for reasons discussed below.

Claims 1-21 remain pending in the application upon entry of this response. Claims 1, 9, 11, and 21 have been amended. Reconsideration of the rejected claims is requested for reasons presented below.

Claims 1, 6-7, 9-11, 16-17 and 19-20 were rejected under 35 USC § 102(e) in view of Martin, et al., U.S. Patent No. 6,402,924, (herein "*Martin*"). The Examiner asserts *Martin* discloses each and every limitation of the claimed method. Applicant respectfully traverses the rejection.

Martin discloses processes to electroplate copper by varying the ratio of peak reverse current density to the peak forward current density. The ratio of peak reverse/forward current densities is independent from the timing of the individual pulsing times. In fact, *Martin* remains silent to reducing the pulsing times. Therefore, *Martin*, alone or in combination, does not teach, show or suggest a method for electroplating a metal on a substrate, comprising sequentially applying two or more cycles comprising an electrodeposition pulse followed by an electrodisolution pulse to the substrate, wherein each electrodeposition pulse has a first time duration and each electrodisolution pulse has a second time duration equal to or less than the first time duration, and wherein the first time duration of each electrodeposition pulse of subsequently applied cycles is reduced, as recited in claim 1, and claims 6-7 and 9-10 dependent thereon.

Also, *Martin*, alone or in combination, does not teach, show or suggest a method for electroplating a metal on a substrate having a trench, comprising the steps of: (a) sequentially applying two or more cycles comprising an electrodeposition pulse followed by an electrodisolution pulse to the substrate, wherein each electrodeposition pulse has a first time duration and each electrodisolution pulse has a second time duration equal to or less than the first time duration, and wherein the first time duration of each

electrodeposition pulse of subsequently applied cycles is reduced, and (b) applying a DC current to the substrate to deposit the metal to a desired thickness on the substrate, as recited in claim 11, and claims 16-17 and 19-20 dependent thereon.

Withdrawal of the rejection is respectfully requested.

Claims 2-5, 8, 12-15, 18, and 21 were rejected under 35 USC § 103(a) in view of *Martin* as applied to claims above and further in view of Taylor, U.S. Patent No. 6,524,461, (herein "*Taylor*"). The Examiner asserts the invention as a whole would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the disclosure of *Martin* with the teachings of *Taylor* since *Taylor* discloses that such modification to the result effective variables will produce effective coverage of copper on a variety of substrates including the substrates used in the present invention. Applicant respectfully traverses the rejection.

Martin has been distinguished above. *Taylor* discloses a method to deposit metals on a substrate by alternating cathodic pulses and anodic pulses. The cathodic pulses deposit metal while the anodic pulses remove metal. *Taylor* further discloses that the cathodic duty cycle should be relatively short, less than 50%, preferably 30% to 1%, while conversely, the anodic duty cycle should be relatively long, greater than 50%, preferably 60% to 99% (column 13, lines 12-26). Also, *Taylor* depicts cathodic pulses occurring with less duration than anodic pulses, as shown in Figure 1. *Martin* and *Taylor*, alone or in combination, do not teach, show or suggest a method for electroplating a metal on a substrate, comprising sequentially applying two or more cycles comprising an electrodeposition pulse followed by an electrodisolution pulse to the substrate, wherein each electrodeposition pulse has a first time duration and each electrodisolution pulse has a second time duration equal to or less than the first time duration, and wherein the first time duration of each electrodeposition pulse of subsequently applied cycles is reduced, as recited in claim 1, and claims 2-5 and 8 dependent thereon.

Also, *Martin* and *Taylor*, alone or in combination, do not teach, show or suggest a method for electroplating a metal on a substrate having a trench, comprising the steps of: (a) sequentially applying two or more cycles comprising an electrodeposition pulse followed by an electrodisolution pulse to the substrate, wherein each electrodeposition

pulse has a first time duration and each electrodisolution pulse has a second time duration equal to or less than the first time duration, and wherein the first time duration of each electrodeposition pulse of subsequently applied cycles is reduced, and (b) applying a DC current to the substrate to deposit the metal to a desired thickness on the substrate, as recited in claim 11, and claims 12-15 and 18 dependent thereon.

Further, *Martin* and *Taylor*, alone or in combination, do not teach a method for electroplating a metal on a substrate, comprising sequentially applying two or more cycles comprising an electrodeposition pulse followed by an electrodisolution pulse to the substrate, wherein each electrodeposition pulse has a first time duration and each electrodisolution pulse has a second time duration equal to or less than the first time duration, wherein the first time duration is from about 500 milliseconds to about 3,000 milliseconds, and wherein the first time duration of each electrodeposition pulse of subsequently applied cycles is reduced, as recited in claim 21.

Withdrawal of the rejection is respectfully requested.

In conclusion, the references cited by the Examiner, alone or in combination, do not teach, show, or suggest the invention as claimed.

Having addressed all issues set out in the Final Office Action, Applicant respectfully submits that the claims are in condition for allowance and respectfully request that the claims be allowed.

Respectfully submitted,



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